Effective

2 Slot ATCA DC Shelf User Manual

May 2007 **Revision 1.0.0**

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Asis warranty will be for the quality of the Asis Effective 2-Slot ATCA Shelf for a period of one year after the shipment of the product.

Asis may make changes to specifications and product descriptions at any time, without notice.

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Safety Instructions

This symbol indicates potential safety hazards regarding product operation or maintenance to operator or service personnel.

General Safety Practices

Before handling the chassis, read the instructions and safety guidelines on the following pages to prevent damage to the product and to ensure your own personal safety.

- Always use caution when handling/operating the chassis. Only qualified, experienced, authorized electronics service personnel should access the interior of the equipment. The power supplies produce high voltages and energy hazards, which can cause bodily harm.
- Use extreme caution when installing or removing components. Refer to the installation instructions in this document for precautions and procedures. If you have any questions, please contact ASIS Technical Support.
- Always follow the procedural instructions for component removal and replacement in sequence.

Power

Beware Electrical shock hazard , before any attempt to service the device be sure That the device is electrically isolated !!!

High voltages are present inside the chassis when the unit's power is plugged into an electrical outlet. Turn off system power, turn off the power supply, and then disconnect the power cord from its source before removing the chassis cover.

Turning off the system power switch does not remove power to components.

Make sure the work environment is grounded, and use a grounding wrist strap when handling the product.

ESD Safety Practices

Many components described in this document can be damaged by *electrostatic discharge (ESD)*. Follow the precautions described here and before specific procedures in the document to protect static-sensitive components from ESD-related damage.

Static electricity can harm system boards. Perform service at an ESD workstation and follow proper ESD procedure to reduce the risk of damage to components. ASIS strongly encourages you to follow proper ESD procedure, which can include wrist straps and smocks, when servicing equipment.

Take the following steps to prevent damage from electrostatic discharge (ESD):

- When unpacking a static-sensitive component from its shipping carton, do not remove the component's antistatic packing material until you are ready to install the component in the system. Just before unwrapping the antistatic packaging, be sure you are at an ESD workstation or grounded. This will discharge any static electricity that may have built up in your body.
- When transporting a sensitive component, first place it in an antistatic container or packaging.
- Handle all sensitive components at an ESD workstation. If possible, use antistatic floor pads and workbench pads.
- Handle components and boards with care. Don't touch the components or contacts on a board. Hold a board by its edges or by its metal mounting bracket.
- Do not handle or store system boards near strong electrostatic, electromagnetic, magnetic, or radioactive fields.

Revision History

Number	Date	Comments	Author
1.0.0	May 2007	Initial release	Yossi Kuzi

About this Document

This document provides technical information for the Effective 2-Slot ATCA Shelf.

It is intended for technical staff tasked with installing, setting up and configuring the system, and providing troubleshooting assistance and servicing.

Related Documents

For information on the Shelf Manager, see the ASIS Shelf Manager Board user manual.

Instructions relating to software installation and documentation for application software development for this platform are available in the Shelf Manager External Interface Reference Manual.

For Asis product information and additional resources, please visit the Asis website at **www.asis-pro.com**.

Downloads (manuals, release notes, software, etc.) are available via the Technical Support Library product links at **www.asis-pro.com (for registered customers)**.

Information about PICMG (PCI Industrial Computer Manufacturers Group) and the ATCA standard may be accessed on the PICMG Web site at **www.picmg.com.**

Chapters and Their Contents

1	**Introduction**	General overview of the product family and the shelf.	Pg. 13
2	**Understanding the Shelf Components**	Describes the shelf and its components, including the boards installed in the shelf: Backplane, Power Entry Module, Shelf ID Boards. Describes the cooling capabilities of the shelf.	Pg. 14
3	**Installing the Shelf**	Procedures and precautions involved in product installation	Pg. 28
4	**Maintenance And Troubleshooting**	Periodic maintenance, troubleshooting and diagnostic procedures, as well as module replacement instructions	Pg. 35
5	**System Specifications**	Detailed quantitative information about the system's dimensions and operational parameters, operation limitations, certification and standard compliance	Pg. 45

Style Conventions

Verdana	Regular text.
Arial Bold	Commands, keys and other parts of the user interface.
Arial Italics	Names of classes, methods, arguments, exceptions, properties, etc. Also used for special terms, the first time they appear.
`Monospace`	Text displayed on the LCD or on a computer attached to the product.
	Notes, which offer an additional explanation or a hint on how to overcome a common problem.
	Warnings, which indicate potential safety hazards regarding product operation or maintenance to operator or service personnel.

1 Introduction

This chapter includes a summary of the Asis shelf product line and a brief overview of the Effective 2-Slot ATCA Shelf. For acronyms used in this document see Section 5.3.

1.1 Overview of ASIS Shelf Products

As for ATCA Shelf , ASIS offers two product families :

- **Effective** - for cost-sensitive, yet demanding applications.
- **Perform -** for top-of-the line solutions, for environments in which high levels of performance, availability and reliability are mandatory**.**

1.2 Effective ATCA DC Shelf

The Effective 2-Slot ATCA Shelf offers the reliability and availability of the Telco-grade standards in a package, where maximum possible performance (backplane interconnect bandwidth, power levels and thermal capabilities) is provided in the shelf. Every aspect of the Effective 2 slot Series ATCA has been developed to surpass the Current solutions found in the market. The Effective 2 slot ATCA has been developed based on the accumulated knowledge and experience in the implementation of the ATCA standard since its inception in 2001, while incorporating the latest technologies available. It incorporates the latest technologies available to reduce its price while maintaining performance and reliability. The system offers optional redundancy for power input and management functions. All shelf assemblies are designed using Field-Replaceable Units (FRUs), thus enabling easy and fast field maintenance with minimum or no downtime, availability of 99.999%. In addition, an Asis cable-holder frame can be fitted to both side-mounting flanges of the shelf.
The Effective 2-Slot ATCA Shelf is designed to comply with FCC, and CE certification, and with UL, NEBS Level-3 and ETSI.

It is fully complies to AdvancedTCA™, PICMG 3.0 R2.0, and IPMI v 1.5.

2 Understanding the Shelf Components

This chapter summarizes the functional features of the Effective 2-Slot ATCA Shelf, and describes in further detail each of the components as well as the shelf system cooling mechanism.

The system was designed to withstand extreme conditions (to meet rigid Telco requirements). It is designed to incorporate Field-Replaceable Units (FRUs), and is fully field-serviceable.

2.1 Platform Components

A typical platform consists of the following key components:

- **19-inch rack mount shelf** - Base hardware element of the platform, which holds all the components together.
- **Card cage** - Portion of the shelf that holds the modules that are plugged into the backplane. Mechanically compliant with all aspects of PIMG 3.0.
- **Backplane** - Supports one or two third-party ATCA-compliant front boards, and the complementary rear transition module (RTM). The backplane provides full-mesh Fabric interface, and direct mating to the PS's and to the redundant Shelf Manager Shelf manager board.
- **PEM** – Redundant, field replaceable.
- **Fan tray** - Hot-swappable, provides side to side cooling, and is designed to provide N+1 fan redundancy cooling to components on the front and rear of the shelf.
- **Air filter tray** - Keeps the airflow free of dust and particles.
- **Blank Panels** - For air flow management.
- **Shelf ID Board**
- **Cable management Holders** - for Front cable management.
- **Rear connection boards**

2.1.1 Shelf and Boards

Figure 1 shows the block diagram of the shelf and *figures 2* and *3* show front and rear views of the shelf with key components highlighted.

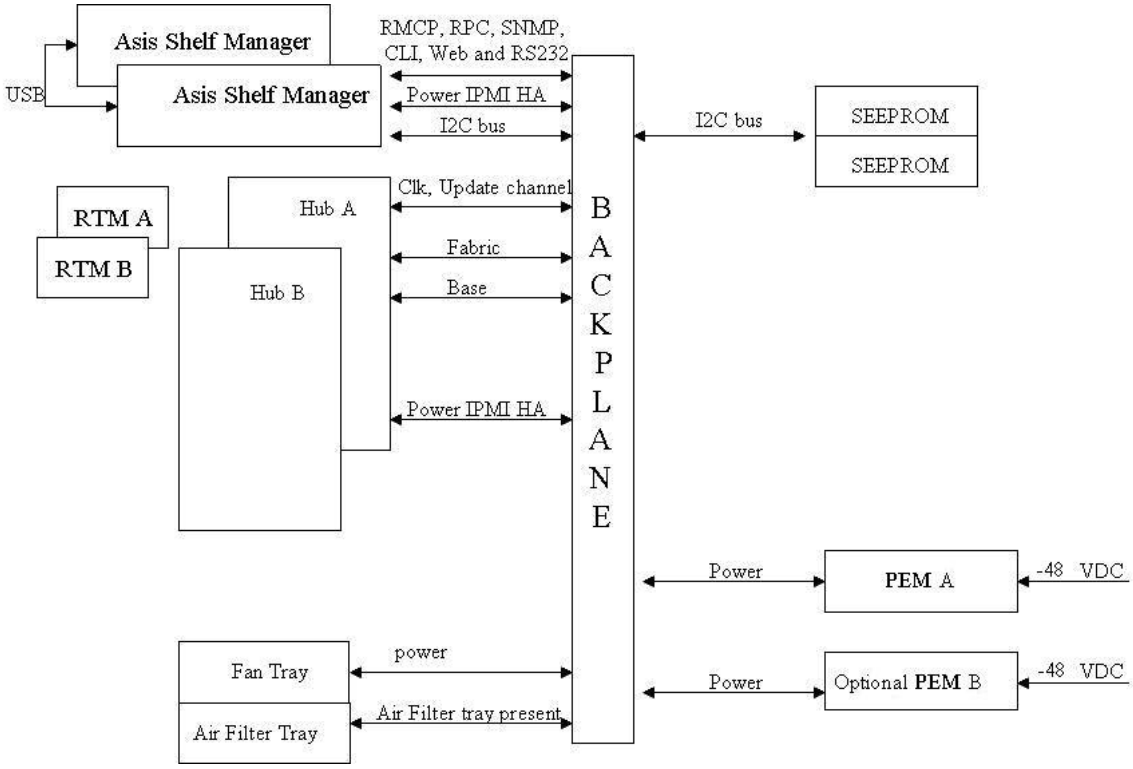

Figure 1 – Shelf Block Diagram

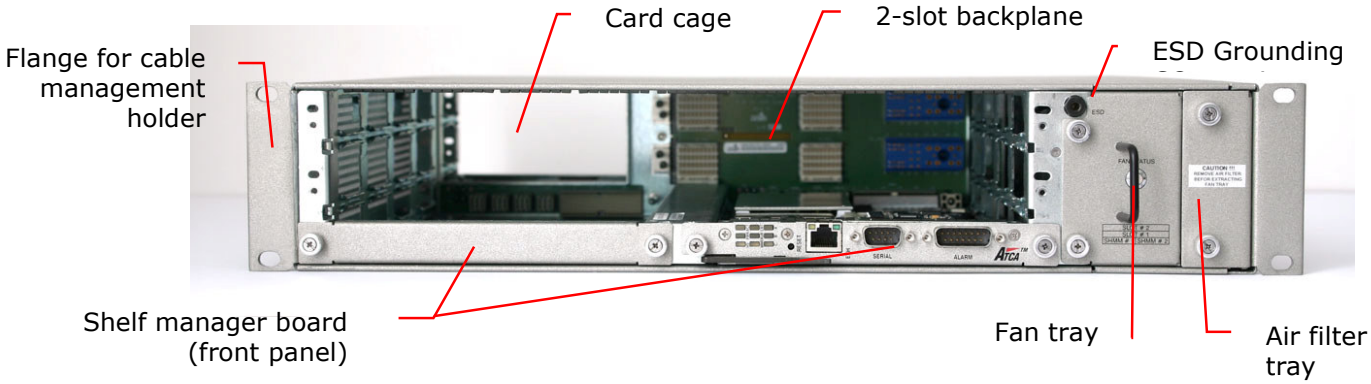

Figure 2 – Shelf Front View

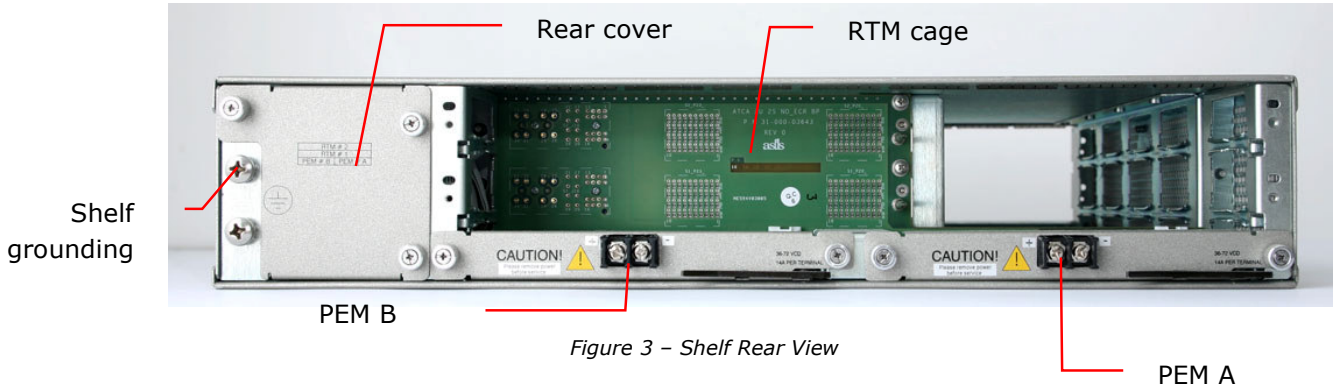

Figure 3 – Shelf Rear View

Figure 4 illustrates the use of cable holders:

Figure 4 – Shelf Chassis with Cable Holders

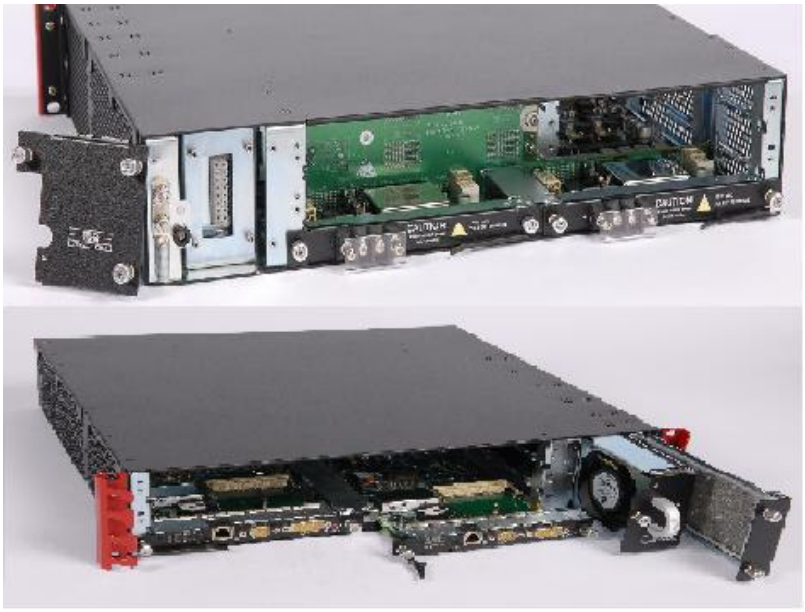

Figure 5 - Shelf Component Positioning

In order to increase ASIS Effective 2 slot ATCA DC Shelf reliability, and to simplify the shelf's format, only one of the boards installed in the Shelf has logic circuits in it. All other boards and FRU's are passive.

Only the backplane is a fixed board. Remaining boards are removable:

Fixed Board

- Backplane

Removable Boards

- Shelf Manager board (see the ASIS Shelf Manager Board User Manual).
- Shelf ID: this board hosts two E²PROMs that contain data about the shelf – such as serial number and manufacturer – and about the board's setup – such as shelf thermal budget and slot population.

2.1.2 Card Cage

The shelf's card cage is composed of:

- the backplane
- right and left guide rails to hold the modules that plug into the backplane.

The card cage supports two 8U front boards, and two 8U RTMs.

The guide rails in the card cage incorporate *electrostatic discharge (ESD)* clips.

2.1.3 Backplane

Features

The ATCA PICMG 3.0-compliant backplane provides external interfaces and card connectivity. It conforms to the PICMG 3.0 R2.0 AdvancedTCA Base Specification.

Backplane features include:

- Two slots
- Fabric interface with full mesh interconnect.
- The Fabric Interface grid consists of eight differential pairs per channel; The Base Interface grid consists of four differential pairs per channel.
- Dual-star Ethernet signalling environment on the Base interface.
- Bussed IPMI (radial IPMI available upon request).
- Two hub slots.
- Hub/Node configuration; update channel between slots 1 and 2.
- 10, 100 and 1000 BASE-T dual star Base Interconnect capability. Update-channel interfaces for active and standby synchronization, and mesh topology handling up to 5Gbps per differential pair.
- Connection capacity for up to two third-party ATCA-compliant front boards, as well as to the redundant Shelf Manager and redundant PEM's.
- Full compliance with AdvancedTCA™ electrical and mechanical specifications (Basic backplane topology is "full mesh".)

- Interconnect for system power for two slots.
- Base channel 1 allocated for the Shelf Manager Controller.

There are no active components on the backplane, and no removable or serviceable parts on the backplane board.

The backplane has two functionally-distinct parts: right and center left:

- Right backplane (consists of Zone 1 connectors) – dual-power connections, which means the power connections from the two PS's are independently supplied to each module plugged into the backplane.
- Center-left backplane (consists of Zone 2 connectors) – connectivity for the Base, Fabric, and update-channel interface. This portion supports a full-mesh topology for both the Base and the Fabric interfaces.

Update-Channel Connections

The update channels are backplane connections between pairs of modules that operate on a redundant basis. Application software can use the update channel for redundancy interlock, or to provide a direct connection that bypasses the (indirect) fabric interface.

If you configure a pair of modules to use the update channel for redundancy support, you must insert the two modules into slots linked by an update channel.

Figure 6 shows the update channel connections.

Each update channel consists of 10 differential-pair connections. If an update channel connects two modules that are not identical, the Shelf Manager disables the update channel between them.

Base interface

The Base interface comprised of a single raw of signal pins for a total of four signal pairs per Base interface. In total the Base interface contains up to 2 Base channels for a total of 8 possible signal pairs per board/slot. A Base channel can be used to support a 10/100/1000BASE-T Port comprised of four signal pairs.

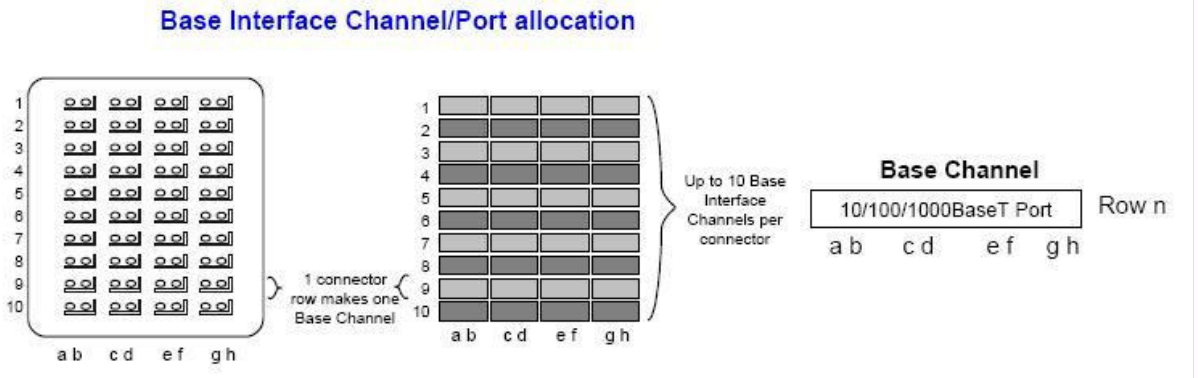

Figure 6– Base interface channel

Fabric interface

The Fabric Interface allocates signal pairs differently than the Base Interface.
A Fabric Channel is comprised of two rows of signal pairs for a total of eight signal pairs per Channel. Thus, each connector supports up to five Channels available for Board to Board connectivity. A Channel may also be viewed as being comprised of four 2-pair Ports.

Synchronization Clock Interface

The backplane supports a set of synchronization clock buses that can exchange synchronization timing information. This synchronization can be used for system-wide and intersystem synchronization purposes, which are important in some applications, such as those involving synchronous time division multiplex (TDM).

Row #	**Interface**	**Px20 Connector Pairs**							
		ab		**cd**		**ef**		**gh**	
1	Clks	CLK1A+	CLK1A-	CLK1B+	CLK1B-	CLK2A+	CLK2A-	CLK2B+	CLK2B-
2	Update channel & Clks	Tx4(UP)+	Tx4(UP)-	Rx4(UP)+	Rx4(UP)-	CLK3A+	CLK3A-	CLK3B+	CLK3B-
The update channels are routed to adjacent slots. Slot 1 connects to Slot 2.									

Figure 7 – Synchronization clock and update channel pin assignments

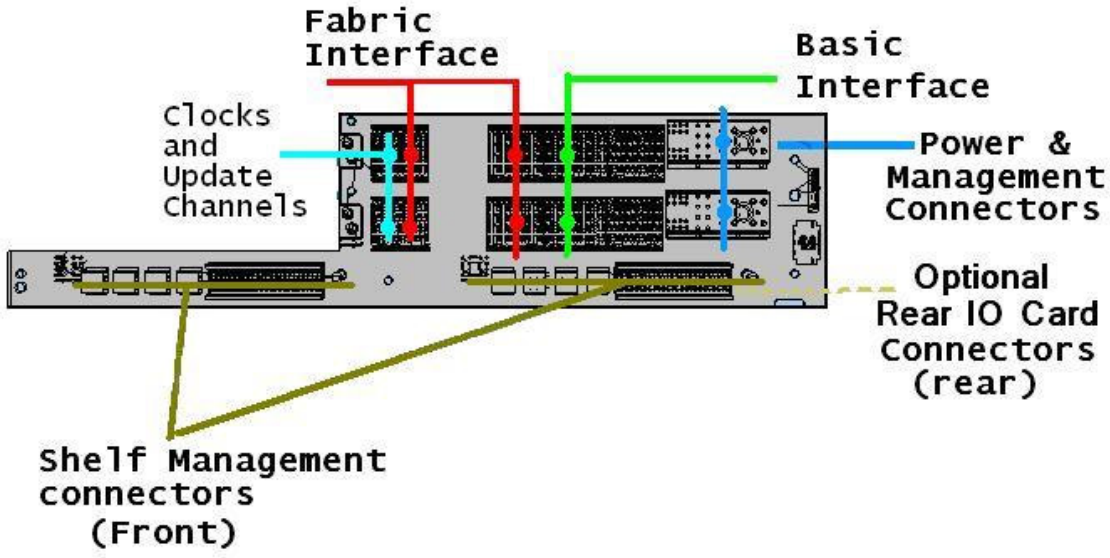

Figure 8 – Backplane layout

2.1.4 Module Slot Identification

The shelf is compliant with PICMG 3.0 R2.0, and accepts modules compliant with this standard.

Figure 9 illustrates the locations of the module slot allocations when viewed from the front. The physical and the logical slot allocations are the same for this shelf: the slots are numbered 1 to 2 from bottom to top.

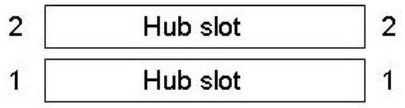

Figure 9 – Slot Allocations

The following table shows the hardware addresses in relation to the slot numbers and slot addresses. Slots are shown in the same order as they appear in the shelf: slot 2 above slot 1.

Slot Number	Hardware Address (8 bit format)	Hardware Address (7 bit format)
2	84h	42h
1	82h	41h

Figure 10 - Shelf Addressing

2.1.5 PEM

The Power-Entry Modules (PEMs) provide power filtering and over-current protection to the Effective 2-Slot ATCA Shelf. Each PEM is located on a tray that slides directly into the backplane.

Each PEM provides a -48 VDC/-60 VDC input filter, and is capable of supplying 100% of shelf power.

The dual redundant EMC filtered power feeds provide common-mode and differential-mode filtering for conducted emissions.

Figure 11 – ATCA 600W DC PEM

Redundancy

In typical installations the –48 VDC feeds are independent of each other so that if one feed fails to supply adequate power, the other feed continues to supply power through a single PEM.

The first feed (-48V A) is sourced from PEM-A (left side). The second feed (-48V B) is sourced from PEM-B (right side of the shelf). Both feeds are individually routed to each of the FRUs. The FRUs isolate the two sources to allow full redundancy.

If one PEM malfunctions, the other PEM can provide all the power needed for the platform. The PEMs are hot-swappable FRUs, so a malfunctioning PEM can be replaced without disrupting the platform normal operation.

⚠ caution – when replacing a Pem make sure that the power source is disconnected And insolated.

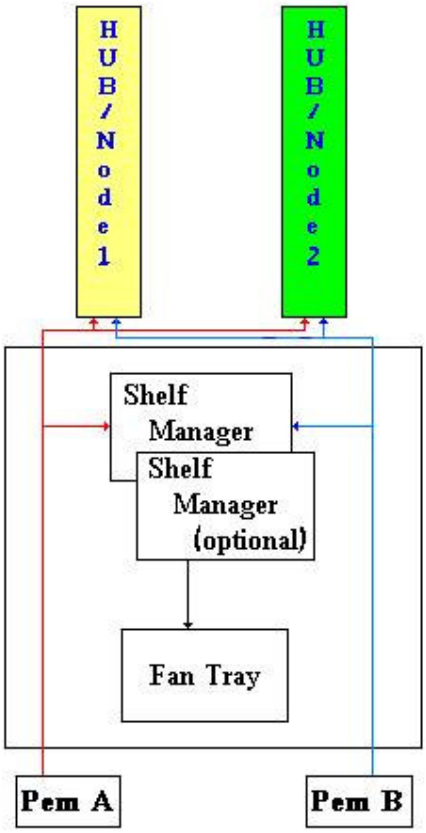

Figure 12 –Distribution of Power on Shelf

The -48V power feeds provide power to the backplane connector for all the front cards and FRU's.

Grounding Requirements and Power Input

When connecting ground and power cables to the shelf, follow instructions in the beginning of this document. see safety instructions at page **xxii**.

A readily-accessible disconnect device must be incorporated into the building's wiring between the shelf's PEM input terminals and the power source. The installed breaker is determined by the voltage of the nominal input.

The supply circuit should be capable of delivering the equipment nameplate ratings of -48V@100A or -60V@100A.

The frame-ground cable must be a high-quality return and safety cable, no smaller than #10 AWG stranded for -48V.

The PEMs are hot-swappable, which means a PEM can be inserted or removed from the backplane while the system is operating. The remaining installed PEM continues to power the shelf.

2.1.6 Fan Tray

The fan tray is a closed module containing four 80x80mm fans that supply air volume and velocity for cooling the high-density/high-performance computing environment.

The cooling power of the four fans can dissipate the heat generated by up to two front boards and complementary RTMs.

More than 200W for front board and 15W for RTM, per slot is supported.

Three of the fans are dedicated to cooling the front side of the shelf, while the fourth one is shared between the front side boards and the rear side I/O equipment.

The fan tray is designed with N+1 redundancy to meet the cooling requirements of a full shelf.

In case of single fan failure, the remaining fans provide the required cooling to dissipate the heat generated by the occupied slots. It is recommended to replace the fan tray as soon as possible.

The fan tray is factory-mounted in the Effective 2-Slot ATCA Shelf. It is easily replaceable, and can be replaced while the shelf is operating.

For more on shelf cooling, see Section 2.2.

Figure 13 – Fan Tray

2.1.7 Air Filter Tray

A NEBS-GR63-compatible air filter comes installed on the ASIS Effective 2 slot ATCA DC Shelf. The filter is field-serviceable, and can be extracted for periodic field maintenance or for field replacement.

The filter is easily accessible from front right side of the card cage. A shelf-based micro-switch detects the installed filter and reports its presence to the Shelf Manager.

For instructions on air-filter maintenance, see Section 4.1.2.

Figure 14 – Air filter tray

2.1.8 Blank Panels with/without air baffles

Compliance with AdvancedTCA temperature specifications requires a steady air flow in the shelf. To insure a steady air flow, either the ASIS Effective 2 slot ATCA DC Shelf must be fully populated, or a blank panel, available from ASIS, must be equipped to fill every empty slot.

The "blank panel" is designed to emulate the air flow restriction in a standard card, thus ensuring the required conditions for proper cooling.

Three types of airflow-management panels are available for the empty slots on the shelf. These include panels specifically designed for:

- blank front module panels, with/without air baffle;
- blank RTM panels;
- an empty shelf-manager panel slot.

Figure 15 - Blank filler front Panel and Blank filler RTM Panel

2.1.9 Shelf ID Board

A shelf ID board containing two redundant field replaceable E²PROM chips housed in the rear of the Effective 2 slot ATCA DC Shelf.

The E²PROMs store product and manufacturer information such as shelf serial number, part number, backplane routing assignment, and shelf heat budget.

When the Shelf Manager board boots up, it compares the information stored in the two E²PROMs:

- If E²PROM data coincides, it is loaded and saved in the Shelf manager Board,

  and the shelf initializes.
- In case of a mismatch, the data on the E²PROMs is compared with the last saved configuration in the Shelf manager Board:
  - If the saved configuration matches one of the E²PROMs it is assumed to be the right one and it is stored in both E²PROMs.
  - If the three configurations are all different, the Shelf manager board will not boot up.

Figure 16 - Shelf ID Board place(rear cover removed)

2.1.10 Holder for Cable Management (Optional)

A cable holder frame can be fitted to both side mounting flanges of the shelf.

Cables attached to the cable management holder must be allowed to move freely; Insure that a service loop of minimal required length is maintained.

2.2 Shelf Cooling

2.2.1 Overview

ASIS Effective 2 slot ATCA DC Shelf complies with all the cooling requirements specified in PICMG 3.x specifications.

The cooling system consists of four high-performance fans. The air comes in from the right side and exits through the left side of the shelf. The fault-tolerant design is optimized for airflow of more than 200W per module.

2.2.2 Fan Tray Design

ASIS Effective 2 slot ATCA DC Shelf ventilation is achieved by four 80x80 mm fans, installed in the fan tray. The fans provide for n+1 redundancy.

Figure 17 - Fan and Air filter trays

The fan tray connects directly to the backplane, where it plugs into power and control connectors. The fan tray unit is front-serviceable, and can be easily replaced without tools.

In order to minimize possible failures, the fan tray does not contain any active electronic components. The shelf management FRU fully controls adjustments of the fans based on temperature changes.

Cooling ability is maintained even in the case of a single fan failure. In this case, the green LED of the fan tray turns red, so that it is easier to identify the tray that needs to be replaced.

2.2.3 Performance

The four fans supply air volume and velocity for cooling the high-density/high-performance computing environment. The cooling power of the fans can dissipate the heat generated by up to two front boards and complementary RTMs. At least 200W per front board and 15W for RTM per slot is supported.

Refrain from clogging air input and exhaust during chassis operation.

2.2.4 Fan Speed

When a fan tray is inserted into the shelf, the fans start at full speed and then decrease by steps of 7%. Under normal operating conditions, the fans run at 21% of full speed. The lower speed reduces the acoustic noise and increases the longevity of the fans. The circuitry on the fan trays uses a pulse-width modulation to control the speed of the fans. The speed of each individual fan is monitored. If the speed of any of the fans drops below the desired fan speed, the other fans will speed up to compensate. The Shelf Manager logs such events in its system event log (SEL) as a fault condition. If this occurs, replace the fan tray as soon as possible to restore fault tolerance and redundancy.

3 Installing the Shelf

This chapter provides you with instructions on how to prepare the Effective 2-Slot ATCA Shelf for use.

You will be performing some or all of the following setup tasks:

- Site Planning
- Checking Package Contents
- Rack Mounting
- PEM installation.
- Third-party Application Card Insertion
- Extracting/inserting Modules
- Third party board Extraction/insertion

➔ **To extract an ATCA-compliant third party board:**

1. Pull the board's insertion lever slightly.

   The de-activation sequence begins.
2. After the board's blue led lights steady, pull out the board's insertion lever.
3. Pull out the board.

➔ **To insert an ATCA-compliant third party board:**

1. Push the board inside the shelf , make sure it is in the correct gliding rails.

   The activation sequence begins.
2. After the board blue led is off , the board should be active , if not please refer to the manufacturer manual.

3.1.1 Shelf manager insertion

➔ **To insert a shelf manager:**

1. Push the module's inward carefully.
2. push the insertion lever inward, making sure it goes fully in to the niche.
3. the blue led should start to blink until the shelf manager confirms that it's checksum it identical to the e²proms.
4. After the module's blue led turn off (data match), the module is active.

3.1.2 Shelf manager Extraction

➔ **To extract a shelf manager:**

1. Pull the module's insertion lever slightly.

   The de-activation sequence begins.
2. After the module's blue led lights steady, pull out the module's insertion lever.

3. Pull out the module.

3.1.3 Power Entry Module Extraction/insertion

If PEM redundancy is implemented, one of the PEMs can be extracted without stopping service.

➔ **To extract a PEM:**

1. Turn off the circuit Breaker.
2. Turn off power to the PEM from the power supply.
3. Remove the protection cover.
4. Disconnect the power cables.
5. Fully pull out the module's insertion lever.
6. Pull out the module.

➔ **To insert a new PEM:**

1. Push in the module inside carefully .
2. Reconnect the power cables.
3. Reconnect the protection cover , screw back the two thumbscrews .
4. Turn on the power to the PEM.
5. Turn on the circuit Breaker.
6. Check if the Shelf manager recognized the PEM. (please refer to the shelf manager user manual)

.

Before installing the Effective 2-Slot ATCA Shelf, you should be aware of what cables will be needed for equipment and power, and whether they will be connected in the front or rear of the shelf.

3.2 Tools Required

To install the shelf in a standard 19" rack, the following tools are required:

- Standard Philips screwdriver set
- Wrench
- ESD grounding bracelet.

All the modules in the Effective 2-Slot ATCA Shelf are field-replaceable units (FRUs) requiring no special tools for mounting other than those mentioned above.

3.3 Site Planning

Only qualified personnel should be involved with this installation procedure.

The Effective 2-Slot ATCA Shelf can be installed either on a standard 19" rack or as a desk-top unit. All sides of the shelf should be easily accessible.

The prerequisites for setting up the Effective 2-Slot ATCA Shelf for use in your facility involves:

- If a rack is used, it should be properly grounded.
- A readily accessible disconnect device must be incorporated into the building's wiring between the shelf's PEM's input terminals and the power source.
- The disconnect device rating required is determined by the nominal input voltage.
- To ensure sufficient airflow for the individual blades in the shelf, allow at least two inches of clearance at the side air inlets and outlets.

3.4 Checking Package Contents

The following items are included in the Effective 2-Slot ATCA Shelf package. Check that all items in the package are intact.

Use of equipment damaged during delivery could prevent proper functioning of the Shelf and/or cause permanent damage to it. Check all pins, screws and other components before using any of the package contents.

- Shelf chassis with backplane
- Fan tray
- Air filter tray
- 1 Shelf manager (optional second for redundancy)
- 1 600W PEM
- 2 Cable-management holders (optional).

3.5 Installation Steps

The following overall procedure is described more in detail in the sections below.

1. Install the Cable-management tray holder (optional).
2. Mount the chassis in the rack with four screws.
3. Connect the chassis to the site ground with a ground cable.
4. Insert a Shelf Manager board into the right slot.
5. if applicable insert second shelf manager to the left slot.
6. insert the Pem in to the slot (from the rear of the chassis)
5. Connect the PEM to a properly Power Supply.

3.6 Rack Mounting

You will need four M6x10 (or longer) screws to mount the chassis on the rack.

Before you begin:

- Verify that the transient operating temperature in the area of the rack does not exceed the 55°C maximum, and that the rack has support rails installed.
- Confirm the rack is stable so that the weight of the shelf does not cause it to tip over.

➔ **To mount the shelf on the rack:**

- Two Persons needed to Preform this task.
- Insert the Effective 2-Slot ATCA Shelf chassis on the 19" rack, securing it by fastening the four mounting screws.

  The shelf should be level, and not positioned at an angle in the rack, and the rack's doors should be able to close.

3.6.1 Shelf Grounding

Connect rear grounding screws on the rear left side to insure that the shelf is properly grounded.

Figure 18 - Rear grounding screws

3.6.2 Installer Grounding

> Any person involved in handling the shelf or card installation or replacement is required to wear an ESD grounding device.

One grounding sockets can be found on the shelf:

- an ESD grounding socket in the front of the shelf

Figure 19 - Front ESD Socket

3.7 Third-party Application Card Insertion

Third-party application cards must be ATCA-compliant.

Application cards should be inserted only after the installation, power-up and testing procedures of the Effective 2-Slot ATCA Shelf have been completed.

Insert application cards according to the manufacturer's instructions, making sure they are properly-positioned in their slots and are secured to their respective connectors.

When an application card is inserted and powered up, the blue LED should switch on and light steady for 10-30 seconds (depending on the card type). After that time, the blue LED should blink for about 10 seconds, and then go off.

Each third-party application card must provide a hot-swap LED. This LED can be in one of the following states:

Indicator State	Indication
Off	The card is not ready for removal or disconnection from the shelf
Blue	The card is ready for removal or disconnection from the shelf
Blinking slowly	The card is activating itself
Blinking quickly	Brief deactivation has been requested

3.8 Extracting/inserting Modules

3.8.1 Third party board Extraction/insertion

➔ **To extract an ATCA-compliant third party board:**

1. Pull the board's insertion lever slightly.
   The de-activation sequence begins.
2. After the board's blue led lights steady, pull out the board's insertion lever.
3. Pull out the board.

➔ **To insert an ATCA-compliant third party board:**

1. Push the board inside the shelf , make sure it is in the correct gliding rails.
   The activation sequence begins.
2. After the board blue led is off , the board should be active , if not please refer to the manufacturer manual.

3.8.2 Shelf manager insertion

➔ **To insert a shelf manager:**

1. Push the module's inward carefully.
2. push the insertion lever inward, making sure it goes fully in to the niche.
3. the blue led should start to blink until the shelf manager confirms that it's checksum it identical to the e²proms.
4. After the module's blue led turn off (data match), the module is active.

3.8.3 Shelf manager Extraction

➔ **To extract a shelf manager:**

1. Pull the module's insertion lever slightly.

   The de-activation sequence begins.
2. After the module's blue led lights steady, pull out the module's insertion lever.
3. Pull out the module.

3.8.4 Power Entry Module Extraction/insertion

If PEM redundancy is implemented, one of the PEMs can be extracted without stopping service.

➔ **To extract a PEM:**

1. Turn off the circuit Breaker.
2. Turn off power to the PEM from the power supply.
3. Remove the protection cover.
4. Disconnect the power cables.
5. Fully pull out the module's insertion lever.
6. Pull out the module.

➔ **To insert a new PEM:**

1. Push in the module inside carefully .
2. Reconnect the power cables.
3. Reconnect the protection cover , screw back the two thumbscrews .
4. Turn on the power to the PEM.
5. Turn on the circuit Breaker.
7. Check if the Shelf manager recognized the PEM. (please refer to the shelf manager user manual)

4 Maintenance And Troubleshooting

This chapter includes instructions regarding:

- Performing Periodic Maintenance
- Fan tray visual inspection
- Air filter cleaning and replacement
- Figure 20 – Shelf Air filter extraction
- Handling Electromagnetic Interference
- Extracting Modules
- Handling Alarms
- Hot-Swapping FRUs
- Resetting The System
- Troubleshooting.

As required by the ATCA standard, the Effective 2-Slot ATCA Shelf applies a fully hot-swappable approach. Assuming redundancy has been provided for (i.e., two Shelf manager board units, and two PEM's), all of the shelf assemblies can be field-replaced with no interruption to service.

Visual alarms provide clear indication of trouble, for easy problem location.

Malfunctions can be responded to quickly and easily, as no field repair is necessary. Failed modules can be easily extracted and replaced with no tools or with a minimal set of tools.

4.1 Performing Periodic Maintenance

This section provides procedural instructions on servicing or replacing shelf components.

Maintenance of the Effective 2-Slot ATCA Shelf involves the following tasks:

- Fan Tray Visual Inspection
- Air Filter Cleaning And Replacement.

4.1.1 Fan Tray Visual Inspection

The fan trays should be checked periodically for any visible damage that could prevent or disrupt normal fan operation.

See Section 4.3.6 for instructions on replacing a fan tray.

4.1.2 Air Filter Cleaning And Replacement

The air filter should be checked regularly. If environmental conditions are good, it may be enough to extract the filter and vacuum clean it. Otherwise it might be necessary to replace it. The air filter can be ordered separately (i.e., without the metal tray).

Air filter cleaning must be performed in a different location from where the shelf is placed.

The air filter can be extracted without interrupting power. Release the two tumble screws

on the front side of the air filter unit and extract the unit by pulling the two tumble screws.

Figure 20 – Shelf Air filter extraction

4.2 Handling Electromagnetic Interference

The shelf emits electromagnetic waves that may interfere with nearby equipment. Conversely, nearby electronic equipment may emit electromagnetic waves that interfere with the shelf. The EMC, EMI, and RFI specifications of the shelf and all nearby equipment should be considered when choosing the placement of the platform and surrounding equipment.

In the shelf and most other equipment, the use of **airflow management fillers** in otherwise unoccupied slots is necessary to keep the product's emissions within their specified limits.

- Install front and rear airflow management fillers into any empty slots.
- Do not use blank faceplates in place of fillers.
- Keep slots populated with active modules directly next to each other and fillers directly adjacent to the outermost active modules.
- If the shelf experiences unexpected and intermittent data errors, carefully consider the possibility of electromagnetic interference from nearby equipment as a possible source of the problem.

Identifying and measuring errors caused by electromagnetic interference can be challenging and may require the assistance of engineering personnel with experience in this field.

If your system configuration does not populate all front slots with active blades, you must fill those empty slots with additional blades or slot flow blocker blades to maintain system airflow and electromagnetic shielding integrity. Blank panels can be ordered separately.

4.3 Extracting Modules

4.3.1 Third-party Module Extraction

➔ **To extract an ATCA-compliant Third-party module:**

1. Pull the module's insertion lever slightly.

   The de-activation sequence begins.
2. After the module's blue led lights steady, pull out the module's insertion lever.
3. Pull out the module.

4.3.2 Third-party Module insertion

➔ **To insert an ATCA-compliant Third-party module:**

1. Push the module's carefully inside the chassis .
2. The activation sequence begins
3. The blue (hot swap) led starts to light .
2. After the module's blue led turn off, the module is active.

4.3.3 Shelf manager insertion

➔ **To insert a shelf manager:**

1. Push the module's inward carefully.
2. push the insertion lever inward, making sure it goes fully in to the niche.
3. the blue led should start to blink until the shelf manager confirms that it's checksum it identical to the e²proms.
4. After the module's blue led turn off (data match), the module is active.

4.3.4 Shelf manager Extraction

➔ **To extract a shelf manager:**

1. Pull the module's insertion lever slightly.

   The de-activation sequence begins.
2. After the module's blue led lights steady, pull out the module's insertion lever.
3. Pull out the module.

4.3.5 PEM Extraction

If PEM redundancy is implemented, one of the PEM can be extracted without stopping service.

➔ **To extract one PEM:**

1. Disconnect the power cables.
2. Release the two tumble screws.
3. Fully pull out carefully the PEM insertion lever.
4. Pull out the PEM.

4.3.6 PEM insertion

If PEM redundancy is implemented, one of the PEM can be inserted without stopping service.

➔ **To insert a PEM:**

1. Push in the PEM
2. Fully push in the PEM insertion lever.
3. tighten the two tumble screws back in to place.

4.3.7 Fan Tray Replacement

The shelf should be used only with a fully-operational fan tray. A malfunctioning fan tray should be replaced immediately, in order to prevent thermal damage to the installed application cards.

Use care when handling the fan trays, and do not handle them from the connectors. Improper handling of the fan trays could cause damage to the connector pins.

Do not handle a fan tray while the fans are operating.

➔ **To replace the fan tray:**

1. Without interrupting power, release the two tumble screws on the front side of the fan tray.
2. Extract the tray by pulling at the handle, as shown below:

   2.1 Insert the replaceable fan tray unit.

   2.2 Push each of the two thumbscrews in and tighten.

Figure 21 – Extracting a Fan Tray

4.3.8 E²PROM Replacement

E²PROMs are generally installed and handled only in the factory. Follow the procedure below in the rare case that it becomes necessary to field replace the E²PROMs.

➔ **To replace an E²PROM:**

1. Without shutting down the system, remove the rear panel, near the two chassis screws, by unscrewing the three tumble screws.
2. remove the E²PROM board.
3. Insert the new E²PROM board into place.
4. Refasten the rear panel using the three tumble screws.
5. From the management console software, run the E²PROMS command manually (see the Shelf Manager External Interface Reference).

Figure 22 - E²PROMs

4.3.9 Third-Party-Module Replacement

As per ATCA specifications, all application modules must be hot-swappable.

For specific instructions regarding third-party module replacement, refer to the documentation provided by the manufacturer.

For general instructions on FRU module replacement, see Section 4.3.1.

4.4 Handling Alarms

Both visual indicators and software alarms are provided.

4.4.1 Visual Alarms

Nine LEDs at the front of the Shelf Management card provide visual alarms.

LED Functions: General LEDs

LED	Status	Meaning
ACT	Green	Shelf manager is active
	Red	Shelf manager failure
	Blink	Shelf manager is inactive
PWR	Green	Local voltage supply on Shelf manager is good
	Off	Local voltage failure
HS (hot swap)	Steady Blue	Shelf manager is powering up or ready for extraction
	Blinking blue	Shelf manager hot swap process
	Off	Shelf manager is operating

LED Functions: Telco Alarm LEDs

LED	Status	Meaning
CRT (Critical)	Off	Normal operation
	Red	System alarm event
MJR (Major)	Off	Normal operation
	Red	System alarm event
MNR (Minor)	Off	Normal operation
	Red	System alarm event

Upon completion of boot-up, LEDs will display as follows:

General LEDs		Telco Alarm LEDs	Application Defined LEDs
ACT	return to normal state	OFF	OFF
PWR	Remains ON		
HS	Lights steady blue for a few seconds, then begins blinking, then goes off after a few blinks		

4.4.2 Software Alarms

The ASIS Effective 2-Slot ATCA Shelf supports software alarms according to *PICMG Specifications 3.0*. Please refer to these specifications for a detailed description.

LED Functions: Application-Defined LEDs

LED	Status	Meaning
A	Green/ red/ bi-color	As defined by application
B	Green	As defined by application
C	Amber	As defined by application

4.5 Hot-Swapping FRUs

All the active components in the platform are mounted on (or housed in) field-replaceable units (FRUs) that you can easily remove and replace. The subrack, backplane, and other non-FRUs do not contain active components.

All FRUs are hot-swappable: you can remove and insert a FRU without shutting down any other shelf component. Hot swapping facilitates planned maintenance activities and FRU replacement.

The platform includes front-panel LEDs and a Telco alarm, which can be configured to activate when a hardware or software failure occurs. If an external alarm system is connected to the platform, it will also be activated for the alarm condition. The alarms alert an operator or technician to replace a failed FRU or perform some other maintenance operation.

The following procedures are to be used when modules are hot-swapped.

➔ **To remove a module:**

1. Partially open the module's right ejector latch to activate the module's hot-swap switch.

   The module's IPMC sends to the Shelf Manager a request to deactivate, and the blue hot swap LED blinks at a fast rate.
2. The Shelf Manager determines whether the module can be extracted. If it can, the Shelf Manager grants permission to the IPMC.
3. The IPMC disables the interfaces that are controlled by electronic keying, and shuts down the module's operations. It then notifies the Shelf Manager the deactivation is complete. The blue LED remains lit.
4. Extract the module.
5. The Shelf Manager reclaims the module's power budget. Also, as part of electronic keying, the Shelf Manager disables - on other modules - the interfaces that are only shared with the deactivated module.

4.6 Resetting The System

One or both of the following reset options should be used if the shelf management card is not responding. (The second step should be performed only if the first one has not solved the problem.)

1. Press the Reset button on the Shelf manager (Shelf Manager card) board front panel.
2. Extract the Shelf manager board from the chassis, and re-insert it.

4.7 Troubleshooting

The following table summarizes potential problems and recommended solutions.

Problem	Probable cause	Solution
Shelf manager Shelf manager board does not boot up properly: One or more of the LEDs fails to light during boot-up. The LEDs fail to return to their status as described in Section 4.4.1, above. The blue LED does not blink.	Shelf manager Shelf manager board is not in fully inserted in the cage. Shelf manager board failure.	Check that the Shelf manager Shelf manager board is properly inserted in the cage; Verify that the ejector clip is closed. Replace Shelf manager board.
Fans fail to operate at power up	Shelf manager board improperly inserted in the chassis. Shelf manager board failure. Fan tray failure.	Replace Shelf manager board. Replace fan tray.
Fan speed does not decrease after boot-up is completed	Shelf manager board failure.	Replace board.
Fan tray LED is lit red	One or more of the fans are not working. Logic failure.	Pull the fan tray out for few seconds until all fans stop spinning, and re-insert it. Replace fan tray. Replace Shelf manager board following this sequence: Insert a second Shelf manager board in the redundant slot; Issue a switchover command to switch shelf control from the current Shelf manager board to the redundant one; Extract the old Shelf manager board.
Circuit Breaker trips off	Chassis power trouble.	Replace Power Entry Module. Remove all third-party and Shelf manager boards to isolate the failure.
Boot sequence does not complete, and the blue LED continues to blink after the Shelf Management card has been replaced and all relevant monitor commands have been performed	One of the Backplane's connectors is damaged. One of the cage units, or the ATCA board, does not fit properly in the cage.	Replace E²PROMs. if you have not yet done so; Replace chassis.

5 System Specifications

This chapter documents the product's standards certification, and physical and other technical specification parameters.

5.1 Certification

The Effective 2-Slot ATCA Shelf is targeted for NEBS level-3, FCC, UL and CE certification. It complies with the following standards:

- Advanced TCA, PICMG 3.x
- IPMI v 1.5.

5.2 Technical Data

The following table presents technical specifications for each of the product elements.

Category	Property	Description/ Value
Physical		
	Number of slots	2 slot 8Ux280mm, front blades; 2 slot 80mm, RTMs
	Dimensions	133.35 mm (3U)"H x 448mm (17.637")W (19" rack mount) x413.4mm (16.275")Depth not including handles & cable holders
	EMI	EMI gasketing and hardware spacing to support FCC part B
	Weight	11Kg
	Compliance	PICMG 3.0 R.2.0
	Temperature	Humidity: 5% to 95%, non-condensed
		Storage Temperature: -40° to +70° Celsius
		Operating Temperature: -5° to +55° Celsius
	Other	Front and rear ESD jack
		Front rack flanges
		Front cable management tray

Category	Property	Description/ Value
Accessibility		
	Front	Shelf Manager, Fan Tray, Front boards, Air Filter Tray, Power Supply.
	Rear	Rear management modules, RTMs.
Backplane		
	Bus architecture	Up to two third-party ATCA-compliant front boards, full mesh, dual redundant Shelf Management Shelf manager boards, bussed IPMB (radial by request).
	Signal bandwidth rating	Supports up to 5Gbps per differential pair.
	Base interface	Base channel interconnect between two ATCA slots, with support for 10/100/1000 BASE-T Ethernet; base channel 1 is allocated to Shelf manager (Shelf Manager)
	Fabric interface	Fabric channel interconnect between two ATCA slots; Replicated fabric channel upon request.
	Hub/Node slots	2 logical slots 1 & 2; Hub/Node configuration
	Update channels	Update channel between slots 1&2
Power		
	DC PEM	back redundant, hot swappable, integral pem.

Category	Property	Description/ Value
Cooling		
	Number of fans	Front hot-pluggable fan tray with 4, N+1, axial fans for front and RTM slots
	Redundancy	N+1 (i.e., any one fan can fail with no service degradation)
	Fan speed	Variable speed under shelf management control
	Cooling capacity	More than 200 Watt per front board, 15W per RTM slot - temp. rise: <9[C]
	Air Flow (with air filter unit installed)	Average of 65 cubic feet per minute (CFM) per slot
Alarm I/O		
	Electrical/Mechanical Placement	Dual redundant Alarm I/O Modules accessible from front of chassis
	Alarm I/O interfaces	15-pin DA-15P connector. Supports 4 outputs (Major, Minor, Critical, Power) and 2 inputs (Major & Minor Reset)
Regulatory		
	Safety	Designed to meet CE, UL, TUV requirements
	EMC	Designed to meet CE & FCC part 15 requirements
	Environment	Designed to be Compatible with NEBS level-3 and ETSI
Other		
	Shelf identity	Configuration board with on-board EEPROM stores shelf serial number, part number, backplane routing assignments, shelf heat budget and other data.
	Removable top cover	Available

5.3 Acronyms Used in this Manual

Acronym	Meaning
ATCA	Advanced Telecom Computing Architecture
FRU	Field-Replaceable Unit
HS	Hot swap
IPMB	Intelligent Platform-Management Bus
IPMI	Intelligent Platform-Management Interface
RTM	Rear Transmission Module
NEBS	Network Equipment-Building Systems
Shelf manager	Shelf Manager Card
ETSI	European Telecommunications Standards Institute
ANSI	American National Standards Institute
CE	"Conformité Européene" ("European Conformity")
PS	Power Supply
FCC	Federal Communications Commission
UL	Underwriters Laboratories - safety standards
CFM	Cubic Feet per Minute – Airflow measurement unit